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found in the human voice. Consequently the faintest vocal tremor imparted to the disk is immediately taken up by them, and immensely magnified. This is done both at the transmitting and receiving ends, the result being that the wire is put into intense molecular vibration of a hitherto unappreciated character. It is evidently not merely lateral vibration, like that of a guitar string, for such motion would certainly be damped in the wire laid in the lake; it would also greatly suffer in the case of a span strung so slackly that at the centre it rests for many feet on the ground, yet such a span was shown to work reasonably well. It is evident, however, that the vibration is not purely longitudinal, for if it were it should be transmitted through a coil of wire flung loosely on the ground; and this, we understand, is not the case. It would, however, be a waste of time to try and formulate a theory apart from experimental investigation. What principally concerns us now is the fact that a mechanical telephone has been constructed, which will speak with absolute distinctness for three and a half miles, and which is simple, cheap, and, most important of all, free from induction. It is easily conceivable that its performances may be much improved; new forms of resonators may be found that have a nearer affinity to the tones of the voice than those already tried. Two vocal chords form the source of all the sounds we can utter, even if we be as gifted as Patti, and it seems possible that some material may be found more nearly allied to their action than wire helices. Although these can vibrate in harmony with the tones of human language, they have not the same quality of sound, and the metallic resonance which they impart to the articulation they transmit is not altogether an improvement.

HEALTH MATTERS.

Preventive Inoculation for Yellow-Fever.

WE are indebted to the *Medical Record* for the following translation of a report which was presented to the Academy of Sciences, Paris, by Dr. Domingos Freire, professor of organic chemistry and biology in the faculty of medicine of Rio de Janeiro, Brazil.

The epidemic of yellow-fever that developed in Rio de Janeiro in 1888 and 1889, and which propagated itself in several other places in the interior of Brazil, has been the means of demonstrating for the fourth time the value of inoculations by means of the attenuated microbe of yellow-fever. The maximum of the epidemic was between the months of December and March, the first sporadic cases having appeared about the end of the month of May, 1888, and the last in June, 1889. During this period there were inoculated 3,570 people; to wit, 988 strangers and 2,582 Brazilians, divided thus: the city of Rio, 2,138; city of Campinas, 651; town of Vassouras, 199; city of Nicteroy, 166; city of Santos, 133; Desengano, a village of 425 inhabitants, 102; Serraria, a small town, 80; city of Rezende, 54; Cataguazes, a village of 2,000 inhabitants, 50. The disease swept with great intensity in all of these spots, and the vaccinations were made, for the most part, during the height of the epidemic.

Of the 2,582 Brazilians, there were 1,740 that should be added to the 988 strangers, as this figure embraces not only individuals coming from the interior and resident in the city of Rio for less than six years,—that is to say, non-acclimated,—but also children, who, according to our experience, are just as susceptible as the strangers themselves.

The rate per hundred of mortality among the vaccinated was 0.078: at Santos, at Rezende, at Serraria, and at Cataguazes, the immunity from the disease was absolute. Here is the rate per cent from each locality: Rio, 0.98; Campinas, 0.46; Vassouras, 0.05; Nicteroy, 0.75; Santos, 0.00; Desengano, 0.09; Serraria, 0.00; Rezende, 0.00; Cataguazes, 0.00. The mortality from yellow-fever among the non-vaccinated was 4,135, divided thus: city of Rio de Janeiro, 2,407 (this includes the dead from the Marine Hospital); Campinas, 812; Vassouras, 15; Nicteroy, 177; Santos, 650; Desengano, 221; Serraria, 21; Rezende, 11; Cataguazes, 20. Among the 4,135 there were about 2,800 strangers, of whom, 1,176 died in Rio (and 750 of these in the Marine Hospital), 63 at Nicteroy, 500 (about) at Santos, 300 (about) at Campinas, 7 at Desengano, 3 at Rezende, 3 at Vassouras.

Thus one-fourth of the deaths were among Brazilians who were

unaccustomed to the poison, inasmuch as they resided in localities where the epidemic appeared for the first time this year. In order to make the efficacy of the inoculations more marked, it suffices to remember the proportion established by M. Jemble in Senegal; namely, that among the strangers who had been there from one to three years, 75 per 100 were attacked by yellow-fever, and 68.06 per hundred died.

Applying these facts to the vaccinated strangers, or the provincials who had from a few days' to three years' residence in the infected locality, the following results were obtained. At Rio were vaccinated 1,183 people under the above conditions, of whom at least 591 should have succumbed to the disease, but only 18 died. Thus 573 lives were saved. At Campinas, a city that never before had an epidemic of yellow-fever, and where the 651 inoculated might be considered as new arrivals, of whom 325 should have died, the unsuccessful inoculations were but 3. At Vassouras, 5 should have died; one only died, who was not a recent arrival. At Nicteroy the 11 strangers, under the conditions cited above, should have furnished five deaths; one only was a victim. At Santos, of 57 persons under the same conditions, 28 should have died, but the immunity from disease was absolute. At Desengano, the two unsuccessful inoculations were among strangers who had lived from six to eight years in the country. But in view of the fact that the disease obtained for the first time, all of the 102 persons inoculated were as susceptible as strangers who had just arrived. Among them 51 should have died. At Serraria, according to the main calculation, 39 should have died, whereas the immunity from the disease was absolute. The same reflections apply to Rezende, where the 54 vaccinated should have furnished 27 deaths, and at Cataguazes, where the 50 vaccinated should have furnished 25 deaths, in view of the fact that the epidemic made its first appearance in these two localities; still the immunity was perfect, without exception.

There were vaccinated, between 1883 and 1889, 10,524 people, with a mortality of 0.04 per hundred.

| | |
|-----------------------------------|--------|
| Vaccinations made in 1883-84..... | 418 |
| " 1884-85..... | 3,051 |
| " 1885-86..... | 3,473 |
| " 1888-89..... | 3,582 |
| | 10,524 |

Dr. Freire ceased vaccinating in 1887, owing to his trip to Europe and in the United States. The mortality from yellow-fever among the non-vaccinated, during the four epidemics mentioned above, was close on to seven thousand. It may be added, in closing, that all the results given have been authenticated by a large number of medical men, and municipal and police authorities. The vaccinations were made without fee. This succinct statement proves, without question, the truth of all the doctrines founded by the eminent master, M. Pasteur.

ANTIPYRINE HABIT.—To the already long list of drugs the use of which, under proper restrictions, is both beneficial and proper in combating the various ills to which flesh is heir, but whose abuse becomes a curse to humanity, another has recently been added. Scarcely have we learned to properly use antipyrine, says the *International Dental Journal*, than the tocsin of alarm must be sounded against its abuse. The recent discovery of its value as a nerve-tonic places it on the list with morphine, chloral, cocaine, etc., so seductive is its gentle, soothing influence upon the overstrained nerves. Its victims are already found, especially among society women, whose nerves, strung up to a high pitch by the overwhelming demands of a winter season of gayety, seize eagerly upon any thing that will afford relief from the headaches and other disorders arising from prolonged fatigue and overtired nerves. So pleasing is the effect, that it is soon used for every trifling ill feeling, until the patient finds herself unable to live without it, and the fascinating "antipyrine habit" is formed. Properly used as a nerve-tonic, its effects are admirable, but abused, the victim becomes even more hopelessly entangled than the morphine or cocaine victim. The effects vary with the dose. In large doses it produces complete relaxation with loss of reflex action. In moderate doses, continued, it induces convulsions. As a stimulant its effect is much like that of quinine.

Hygiene and Sunday.

Among the questions treated of at the recent congresses in Paris, says the London *Lancet*, that of the observance of the sabbath as a day of rest was not the least interesting. The congress on this subject was presided over by M. Léon Say, who remarked that this rest, which several religions rendered obligatory, is a law of nature, and consequently a law of hygiene, the excellence of which has long been demonstrated, although it is not to be found in all national codes. The resting on the seventh day is of biblical origin, and the custom of counting the days by seven was formerly the rule among the most diverse races, — in India, as among the Celts, in China as well as in Arabia. Now that hygiene has become a positive science, it confirms the moral and material necessity for a temporary rest on the seventh day.

Several reports were presented to the congress, and physicians, professors, philosophers, and hygienists are in accord on this point. All, without exception, support for workers of all classes and of all ages a weekly day of rest, which should even be made obligatory. It may here be noted that in 1881 this subject was opened to competition by the Swiss Government for a prize, which was awarded to Dr. Niemeyer of Leipzig. The subject was brilliantly treated by Dr. Niemeyer, who observed that the dominical rest is the first commandment of hygiene, which should be followed to obtain a peaceful and continued amelioration of society, and in this respect it is as much a rational institution as a religious one.

The following is the summary of the conclusions as voted by the great majority of the members of the congress: "Rest on Sunday is possible in varying degrees in all industries. Sunday is the day which best suits the employer and employed, both as regards the individual himself and his family, and it is well that the day of rest should be as much as possible the same for all. When the Sunday rest is impracticable for certain reasons, it should be replaced by some other day, so that the workman may have fifty-two days' rest in the year as equally divided as possible. This rest permits man to produce considerably more and better work, inasmuch as it contributes to maintain his zeal and to restore his physical forces."

ITALIAN SAUSAGES.—The excitement caused throughout Italy by the detection of extensive frauds in the Bologna-sausage manufacture is spreading. Other cities, notably Florence, are demanding an immediate inspection of the same articles of food as are vended in Italian warehouses. The public, says the *Nazione* of that city, are entitled to some such inquiry in their behalf as has just yielded such startling results in Bologna. Instead of the pig's flesh, popularly supposed to form the main ingredient in the Italian sausage, horse-flesh is that which is really used, — horse-flesh moreover, of more than dubious origin, taken from animals that have died of infectious disease, and even that in an advanced state of decomposition. According to the *Tribuna*, there has been collusion between certain sausage-manufacturing firms and the veterinary authority, the latter winking at frauds which it ought to have exposed. The new powers conferred by the Codice Sanitario, indeed, are finding material for their exercise in quarters hitherto above suspicion; in an industry, to wit, which has long been one of the special boasts of Italy.

NOTES AND NEWS.

THE municipality of Paris is considering the feasibility and expediency of increasing the water-supply for that city by impounding the head waters of the Vigne and Verneuil. This would admit of increasing the water-supply to fifty-five gallons per head per day, the present supply being only twenty-two gallons per head per day, besides giving a much purer water for domestic uses.

— It may prove of interest briefly to describe a series of models that have recently been loaned to the Johns Hopkins University by E. H. Butler & Co. of Philadelphia. The set includes North America, South America, Europe, Asia, Africa, the United States, and Pennsylvania. The models are the work of the Mindeleff Brothers of the United States Geological Survey, who prepared them expressly for the publishers. They have been used in illus-

trating the geographies recently published by that firm. The models surpass in elaborateness any that have hitherto been constructed, and, by agreement with the publishers, they remain the only set, as no copies will be made of the present series. They are made of plaster-of-Paris, and the approximate dimensions are four feet by three feet and six inches. The land is represented in buff on a blue ground, thus assuring a sharp outline to each continent and its accompanying islands. The mountainous portions stand out in bold relief, so that the chief elevations and depressions of the continents are clearly emphasized. The prominent river courses, with their characteristic channels of broad valley or narrow canon, are plainly shown. One of the most striking features in the topography is the distinctness with which the chief drainage basins are outlined. The extent of the Mississippi basin, for example, and the character of its topography are at once apparent. On the enlarged relief of the United States more details are added than were possible on the model of North America, while on that of Pennsylvania the characteristic features of Appalachian topography are plainly exhibited. The great importance of such models for purposes of illustration in physical geography cannot be over-estimated. The value of the entire set is not far from \$2,000. Mr. J. A. Shriver placed the sum of \$175 at the disposal of the Geological Department for the purchase of models and maps relating to physical geography. A set of thirty relief maps, designed by Professor W. M. Davis of Harvard University, to illustrate the development of the more prominent features in topography, has already been acquired, and a second set, showing the associations of topography with geological structure, prepared by Professor N. S. Shaler, has been ordered. In addition to these, several maps relating to special points in physical geography are in course of preparation. A large model of a unique region in Pennsylvania, showing the effect of valley carving on anticlinal and synclinal structure, is at present under construction by a member of the Pennsylvania Geological survey.

— Emin Pacha, who received serious injuries from a fall soon after reaching the coast, is now in fair way to recovery.

— The slight improvements made from time to time in incandescent electric lamps tend mainly in the direction of giving them a longer life. A lamp of the Woodhouse & Rawson make, as reported from Taunton, England, is credited with a service of 10,608 hours before giving out.

— The fifth annual meeting of the Indiana Academy of Science, to be held at Indianapolis, Dec. 30 and 31, has been announced. The officers and *ex-officio* executive committee of the academy are John C. Branner, president; T. C. Mendenhall, Oliver P. Hay, John L. Campbell, vice-presidents; Amos W. Butler, secretary; Oliver P. Jenkins, treasurer; David S. Jordan, John M. Coulter, J. P. D. John, ex-presidents. The list of papers is as follows: "Explorations of the United States Fish Commission in Colorado and Utah," by David S. Jordan; "Explorations of the United States Fish Commission Steamer 'Albatross' in the Pacific Ocean," by Charles H. Gilbert; "Explorations of the United States Fish Commission in Missouri," by Frank M. Drew and Louis Rettger; "Preliminary Note on the Fishes of the Sandwich Islands," by O. P. Jenkins; "Description of a New Species of Rhinoptera from the Gulf of California" (by title), by B. W. Evermann and O. P. Jenkins; "Some Notes on Indiana Reptiles and Batrachians," by A. W. Butler; "Some Rare Batrachians," by W. S. Blatchley; "Fishes of Putnam County," by O. P. Jenkins; "Some Habits of the Crayfish," by C. W. Hargitt; "The Occurrence of the Badger in Indiana," by Amos W. Butler; "Fishes in the Yellowstone Park," by David S. Jordan; "Notes on Some Fishes from the West Coast of Africa, collected by Carl Steckleman," by O. P. Jenkins; "Morphology of Siphonophores," by Louis Rettger; "Notes upon the Economic Phases of Entomology and Ornithology," by C. W. Hargitt; "Observations on the Destruction of Birds by Storms," by A. W. Butler; "Notes on Indiana Butterflies," by Albert J. Woolman; "Investigations on Relation between the Intensity of Stimulus and Re-action Time," by W. J. Bryan; "Incandescent Gas-Lighting," by W. DeM. Hooper; "Dangers of the Electric Circuit," by John L. Campbell; "Apparatus for the Determination of Power Consumption in Friction and